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s (distrance traversed in passing to end of bridge)

$$=\int_0^{2a\pi}\left[b^2\left(\tfrac{1}{2}-\frac{\theta}{2a\pi}\right)^2+\frac{b^2}{4a^2\pi^2}\right]^{\frac{1}{2}}d\theta=(\tfrac{1}{2}b)\sqrt{1+a^2\pi^2}-$$

$$\frac{b}{2a\pi}\log_e(\sqrt{1+a^2\pi^2}-a\pi).\quad b=250.\quad a=\tfrac{1}{4}.$$

$$\therefore\ 2s=250[1+(\tfrac{1}{16}\pi^2)]-(1000/\pi)\log_e\{\sqrt{[1+(\tfrac{1}{16}\pi^2)]}-\tfrac{1}{4}\pi\}=547.6+\ \text{feet}.$$

[See also solutions of problems 41, 45, and 50, published in previous numbers of MONTHLY. EDITOR.]

MECHANICS.

56. Proposed by H. C. WHITAKER, A. M., Ph. D., Professor of Mathematics in Manual Training School, Philadelphia, Pa.

"Hey-diddle-diddle, the cat and the fiddle,
The cow jumped over the moon."

Taking the weight of the cow to be 600 pounds, the initial resistance of the air to be 100 pounds and varying as the square of the velocity, find the initial and final velocities, and the times of rising and falling.

Solution by G. B. M. ZERR, A. M., Ph. D., President and Professor of Mathematics, The Russell College, Lebanon, Va.

Let R=radius of earth=20924640 feet,

$h=60.27R=1261128052.8$ feet=distance to moon,

$g=32.2$ feet, $W=600$ pounds, $\mu v^2=100$ pounds$=\frac{1}{6}W$,

t=time of ascent; t_1=time of descent, v=initial velocity, v_1=final velocity. Then $\mu=W/6v^2$; $1/k=\sqrt{(W/\mu)}=v\sqrt{6}$. $\therefore\ k=1/v\sqrt{6}$.

$h=(1/2gk^2)\log(1+v^2k^2)$, $t=(1/gk)\tan^{-1}vk$,

$t_1=(1/gk)\log[\sqrt{(1+v^2k^2)}+vk]$, $v_1=v/\sqrt{(1+v^2k^2)}$.

$\therefore\ (1+v^2k^2)=\frac{7}{6}$, $vk=1/\sqrt{6}$.

$\therefore\ v^2=gh/3\log(\frac{7}{6})$, $v=449657$ feet=85.16 miles per second.

$v_1=(\frac{6}{7})v=73$ miles per second.

$t=[v\sqrt{(6)}/g]\tan^{-1}(1/\sqrt{6})=13258.2$ seconds=3 hours, 40 minutes, 58.2 seconds.

$t_1=[v\sqrt{(6)}/g]\log\{[\sqrt{(7)}+1]/[\sqrt{6}]\}=13603.7$ seconds=3 hours, 46 minutes, 43.7 seconds.

In the above we have considered the resisting medium as extending to the moon.

57. Proposed by J. C. NAGLE, A. M., M. C. E., Professor of Civil Engineering, Agricultural and Mechanical College of Texas, College Station, Texas.

Over the intersection of two inclined planes slides a cord of uniform mass throughout its length. Find the equation of the path described by its center of gravity.

[No solution of this problem has been received. EDITOR.]